

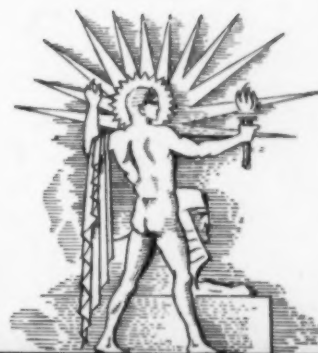
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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



DECEMBER 7, 1935

Lightning and Water

See Page 363

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SCIENCE SERVICE PUBLICATION

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VOL. XXVIII



No. 765

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DO YOU KNOW?

The homicide rate in the United States is found to be 18 times that in England.

Airplanes are being more widely used in mining, for transportation where valuable minerals occur in remote regions.

Flying scientists from the American Museum of Natural History will establish a base in British New Guinea to collect birds and animals in the mountain interior.

Ten thousand flint knives, scrapers, and other implements used in Ireland's Stone Age have been unearthed in County Antrim by Harvard University archaeologists.

The Field Museum knows of two freak trees in the United States that produce peanut-walnuts, that is, walnuts with kernels that drop out of the shell peanut-fashion.

The earth has supplies of energy to meet every need of man for thousands of years, according to Gustav Egloff, Chicago, in an address before the American Chemical Society.

Safety glass is being adopted for partitions.

There are about 500 telephones in Ethiopia, not counting inter-government instruments.

Experiments in fruit canning show that English beet sugars are especially effective in preventing acid corrosion of the cans.

The casting of metal statues by the once popular *cire perdue* or "lost wax" process is being revived with use of modern techniques.

It was because silkworm diseases threatened Europe's silk trade, back in 1876, that a French scientist originated the now popular rayon thread.

Soviet aviator Molokov recently made a flying expedition to study ice fields of Far Northern Siberia from the standpoint of shipping and weather.

More than 250 kinds of cone-bearing trees and shrubs, from all over the world, have been presented to the Morris Arboretum of the University of Pennsylvania.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.

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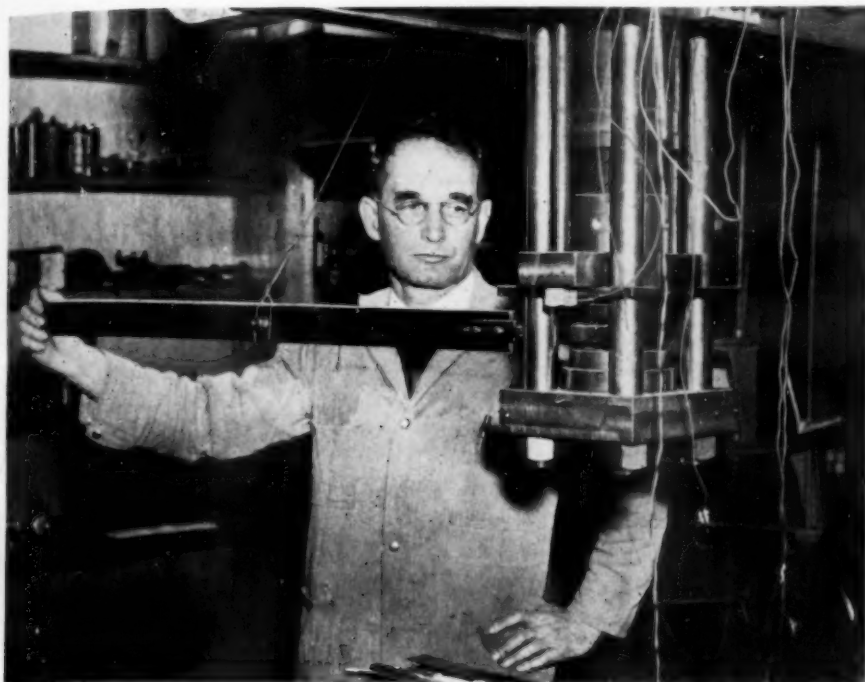
What gland is responsible for tailoring your skin to fit you? p. 357.

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PSYCHOLOGY

Were the Stone Age artists eidetic? p. 357.



DUPLICATING EARTH PRESSURES

Prof. Percy W. Bridgman, of Harvard University, with his apparatus for producing pressures like those of the earth's interior. At the right is the high-pressure apparatus, while his hand rests on the lever for twisting the samples when they are compressed.

New Pressures Make Ice Hotter Than Boiling Water

Million Pounds to the Square Inch Attained at Harvard With New Apparatus; New Substances Created

DISCOVERY of two kinds of ice, one of them hotter than boiling water, a number of previously unknown forms of metals and other substances and a change in the properties of soft graphite so that it temporarily becomes diamond-like and capable of scratching glass-hard steel was announced at Harvard University by Prof. Percy W. Bridgman, as a result of recent high pressure research. (*Physical Review*, Nov. 15)

The discoveries were made with the aid of radically new apparatus which enabled Dr. Bridgman to conduct routine experiments at a pressure of 50,000 atmospheres and upon occasion to reach the tremendous pressure of 1,000,000 pounds to the square inch or 70,000 times the ordinary pressure of the atmosphere.

Formerly routine tests were confined to about 12,000 atmospheres and the absolute maximum was about 40,000 at-

mospheres, at which point the heavy steel sides of his confinement chamber bulged like lead and made measurements impossible.

At these terrific new pressures, higher than scientists have ever been able to reach before, Dr. Bridgman has been able to force atoms and molecules of some substances to take up permanently new positions, thus creating new forms of matter previously unknown to science.

In addition to the new apparatus for these pressures, Dr. Bridgman has also used a new tool for the creation of terrific stresses to "twist" the various atoms and molecules into their new positions, which has cast new light on the so-called shearing laws of solid matter. These unusual pressing and twisting tools are believed to approximate much more nearly than has been done before the tremendous pressures and strains

hundreds of miles below the surface of the earth.

Already three new kinds of solid bismuth have been found, one new kind of mercury, one of gallium, two of tellurium and a number of others, Dr. Bridgman announced.

Moreover, Prof. Bridgman found that under high pressure plus twisting:

1. Rubber was derubberized into a translucent horn-like material.
2. Paper was similarly transformed.
3. Wood and linen cloth were changed in comparable fashion.

Must be Twisted

Control tests on paper, Prof. Bridgman adds in his report, indicate that the 700,000 pounds to the square inch pressure will not, of itself, cause the transformation. The twisting or torque is also necessary.

A new kind of hot ice was described by Prof. Bridgman to a Science Service representative. "Previously five kinds of ice were known," he said. "One of these may be heated to a temperature too hot to bear with the hand if enough pressure is applied to prevent it from melting. The lowest pressure that would suffice to cause this previously known hot ice to appear was about 6,000 atmospheres.

"It is now found that there is still another variety of 'cold ice,' and also a new 'hot ice.' The old hot ice can be forced to change into the new hot ice if a pressure of about 25,000 atmospheres is applied to it. This new ice is hotter than boiling water when it melts, and it may be made to melt at much higher temperatures merely by increasing the pressure."

Dr. Bridgman continued:

"The increase in pressures, which can be reached as a matter of routine and measured with accuracy, has been made possible primarily by the use of new materials for the containers and pistons and a new design. By the new design the steel is made to support itself, the supporting pressure on the outside of the container automatically becoming greater as the internal pressure becomes greater.

70,000 Atmospheres

"This is accomplished by making the container in the form of a conical stopper, which pushes more and more tightly into a external heavy block of steel as the force on the piston increases. With this apparatus, routine measurements up to 50,000 atmospheres have been made for a number of months and pressures up to 70,000 have occasionally been reached.

"The new tool for studying matter

under high stresses is a development quite distinct from that just described. For this study the matter is squeezed in the form of a very thin disk between steel pistons, and then the pistons are rotated, so as to apply a shearing force in addition to the pressure. This shearing force has been found to produce interesting effects, . . . in combination with the pressures, which run up to 50,000 atmospheres.

"Permanent changes are produced in many organic substances. Rubber loses its elasticity after going through this treatment and becomes a translucent horny material; paper is similarly affected. It is necessary to do the twisting to get this effect, for high hydrostatic pressure alone will not give it. Brom thymol blue, a very soluble dye, becomes completely insoluble after this treatment. Red phosphorus is converted permanently into black. The electrical resistance of some metals was found to be abnormally high under this treatment."

Surprised

Lead dioxide was next tried, on the theory that the color change between lead oxide and the dioxide might be noted. Reported Prof. Bridgman:

"To my great surprise lead dioxide detonated violently, leaving a residue of metallic lead."

The first attempt at synthesis was the combination of copper and sulfur, said Prof. Bridgman, adding: "The results were at once positive; there was a detonation at pressures of 20,000 atmospheres (280,000 pounds to the square inch) without rotation, and the product was apparently the ordinary black sulfide."

Some of the explosions were so great that half of the steel pistons used in creating the pressure were blown away.

"Up to date," Prof. Bridgman added, "nearly two hundred elements and inorganic compounds have been examined, and new forms found in nearly half the cases. It is obvious that these polymorphic transitions, as these changes are called, are very much more frequent under high pressures than under ordinary conditions. They must play an important part in the constitution of the earth."

Required Force Great

"It is found that the force required to shear practically all substances under high pressure is very much greater than would have been expected from previous ideas. What is more, the possibility of internal slippage is so diminished that a number of substances which are normally soft may become harder than glass-

hard steel in certain directions and produce deep scratches in the steel.

"This is shown particularly well by graphite, which under ordinary conditions is so soft and slippery that it makes an excellent lubricant. In a special apparatus this was subjected to a pressure as high as 100,000 atmospheres, or one and a half million pounds per square inch. Under these conditions it

became so hard that it embedded itself in the glass-hard steel just as a diamond would have done. There was no permanent change, however, although a change to diamond might have been looked for because diamond is a denser form of graphite, but on release of pressure the graphite resumed its normal soft slippery state."

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ASTRONOMY

Expanding Universe May be Just Scientific Imagination

THAT the earth is near the center of an exploding or expanding universe may be just a false concept built up in the mind of man, suggests Prof. Fritz Zwicky, of California Institute of Technology.

When scientists interpret the much-observed red shift of the light from distant nebulae as proof that the separate parts of the universe are rushing away from one another with velocities as high as 15,000 miles a second, they are making only one of several possible interpretations, says Prof. Zwicky.

The California mathematical physicist points out that (*Physical Review*, Nov. 15) while the theory of relativity partially explains the red shift in terms of an expanding universe the relativity predictions are not in accordance with observation in several important respects.

The red shift of light from distant nebulae is analogous to the lowering of the pitch of a sound like that from the whistle of a locomotive speeding away from the observer at the crossing. In both cases the shift is one toward lower frequencies: for the whistle it is sound frequencies; for the expanding universe concept light frequencies are concerned. Lower light frequencies make the observed rays from the distant nebulae more reddened than they really are. The colors are not necessarily red in the observed spectral lines, but merely shifted in the red direction,—hence the so-called red shift.

In his complex mathematical scientific paper Prof. Zwicky sets up all the requirements which any explanation of the observed red shift must satisfy in order to be acceptable.

For one thing, Prof. Zwicky observes, the shift ought to come out to be the property of any point in space instead of

just that particular corner of the universe around the earth.

"We do not want to assume that our earth is just the center of things," warns the scientist. "The relativity explanation of the red shift satisfies this requirement but so do other theories."

In other requirements the relativity explanation does not meet observed conditions but Prof. Zwicky, in his report, shows how to examine broadly all possible theories and has found, surprisingly, that some theories meet all demands and may be as good as, or better, than, the relativity explanation of the red shift.

The selection among the possible alternative theories must be left to checking by observations. Some of these require new developments in astronomical technique such as the installation of the new 200-inch telescope at Mt. Palomar for the California Institute of Technology. A few years should tell the tale; and in the meantime Prof. Zwicky suggests that his colleagues avoid what in everyday jargon might be termed "getting out on a limb."

Science News Letter, December 7, 1935

ENTOMOLOGY

Argentina Has Ground Its Locusts and Plowed Them In

LOCUSTS, ravaging crop pest in Argentina, are being put to use in the rescue of the very fields they have stripped. Their bodies, harvested by tons from long lines of sheet-iron "locust fences," are ground up for fertilizer and plowed back into the soil. Between 2,000 and 3,000 tons of locust fertilizer are expected to be produced in Argentina this year; there will even be some for export.

Science News Letter, December 7, 1935

PHYSIOLOGY

Vitamin A Found to Aid in Formation of Visual Purple

Linking of Vision With Fat-Soluble Vitamin Found in Milk Is First Evidence of Such Direct Action

FIRST definite evidence of a vitamin participating directly in a physiological process has been found by Dr. George Wald, of the Harvard University Biological Laboratories, who has conclusively proved that the fat-soluble vitamin A found in milk and fish liver oils is present in the retina of the eye and is active in vision.

In the course of this research Dr. Wald also discovered a heretofore unknown yellow pigment which he has named retinene. Like vitamin A, this substance is related to the carotenoids, the coloring matters of many plant and animal tissues. Retinene, he found, is liberated by the action of light on the eye.

For some time science has known that insufficient vitamin A in the diet results in so-called "night blindness," a lowered ability to see in dim light. Since the retinal rods are used principally in dim vision, it has been believed that the vitamin must be associated in some way with these organs.

The discovery of free vitamin A in the retina tended to substantiate this theory. Dr. Wald has now found that the vitamin participates directly in the formation of visual purple, a pigment contained in the retinal rods. The bleaching of this pigment by light is the initial step in the visual process.

When the visual purple is thus bleached an orange material called visual yellow is formed. This process is accompanied by the liberation of a large amount of retinene, to which the color of visual yellow is due. Following bleaching, the orange color slowly fades, the retina finally becoming colorless. At this point it is found that the retinene has disappeared, having been transformed entirely into vitamin A.

In the living animal the vitamin is re-synthesized to visual purple, completing the cycle. This cycle is not a perfect one, however, since some vitamin A is apparently lost in the process. This appears to be one reason why it is necessary to provide the animal with a continuous supply of new vitamin.

In the original experiments with frogs,

Dr. Wald reported observations made principally with a pocket spectroscope. Recently he has been able to obtain objective records of each detail of these results by the use of a recording spectrophotometer, designed by Prof. Arthur C. Hardy of the Massachusetts Institute of Technology.

Science News Letter, December 7, 1935

PSYCHOLOGY

Feeble-Minded Girl Paints "Stone Age Art"

A FEEBLE-minded girl, who paints pictures like the famous cave man's art, has attracted interest of German archaeologists.

It is believed that this girl with ill-developed brain offers an unusual glimpse into the lost world of the Old Stone Age 25,000 years ago, when cave men adorned walls of European caverns with scenes of hunting and magic rites.

The feeble-minded girl, like the cave artists, displays no interest in structure or composition, and is inventive only in use of color. This is the verdict of G. A. S. Snijder, who has studied the pictures. The girl is also what psychologists call "eidetic," meaning that she retains in her mind so vivid a picture of what she sees that she can paint it weeks later as if it stood before her. This

may have been one of the Stone Age artists' traits, and would partly account for their lively and accurate paintings of bison, wild horses, and other animals of the chase. Mentality of the cave dwellers, it is pointed out, was not high, judging by their skulls.

The girl's paintings also show resemblances to the painting style of the civilization of ancient Crete, it is maintained.

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PHYSIOLOGY

Pituitary Gland Makes Skin Grow to Fit Body

THE PITUITARY, tiny and powerful gland in the head, not only makes the body grow but makes all the parts of the body grow the right size in relation to each other, Dr. C. R. Stockard of Cornell University Medical College told members of the National Academy of Sciences.

Dogs with skin so much too big for their bodies that it fell into loose, flabby wrinkles were described by Dr. Stockard. These dogs had other symptoms that showed the pituitary was not functioning properly, although the gland was not causing over-growth of the bones or giantism.

Examination of the pituitary gland in these dogs showed very abnormal arrangements and proportions of the cells within the gland. The condition was not one of overactivity of the gland, Dr. Stockard pointed out, but of another kind of abnormal activity.

From his own observations and those of other investigators, Dr. Stockard has concluded that the growth-controlling hormone made by the pituitary not only stimulates growth but also controls growth by a checking process. It is this



HIS SKIN DOESN'T FIT

Ever notice how "loose-skinned" a bulldog is? These two museum specimens demonstrate it most vividly. The skins were from dogs of the same litter, bred by Dr. C. R. Stockard of Cornell University. One was filled up until all folds and wrinkles were stretched out; the other mounted in normal condition.

latter activity of the gland and its hormone that keeps the skin, for example, from outgrowing the rest of the body. When the skin becomes thick and wrinkled because it is too large to cover the body smoothly, as happens in diseased

conditions, the skin has been freed from the growth-regulating factor and just goes on growing and growing, as tissue does when removed from the body and kept alive in a test-tube.

Science News Letter, December 7, 1935

PHYSIOLOGY

Finding New Lung Function Solves Human Blood Puzzle

STUDIES which clear up a fifty-year old puzzle about human blood were reported by Dr. William H. Howell, emeritus professor of physiology in the Johns Hopkins University, at the autumn meeting of the National Academy of Sciences.

The puzzle was to find where the platelets of the blood are formed. These platelets are little flattened disks which are important because one of their functions is to make blood clot after it has been shed.

The platelets are formed in the lungs, Dr. Howell found.

This is an entirely new idea. Although the platelets were discovered more than 50 years ago and there have been all kinds of theories as to their origin, function and fate, no one has ever thought of looking in the lungs for their birthplace. Until now medical scientists have thought these important platelets were formed in the marrow of bones where the red blood cells and many of the white blood cells are made. The generally accepted view, proposed by Wright, is that they are produced in the marrow from a species of giant cell, to which Dr. Howell many years ago gave the name megacaryocyte.

Now Dr. Howell comes along with the experimental proof that the platelets are made in the lungs. The first evidence was finding that as the blood flows through the lungs it picks up platelets. The arteries always contain more than the veins.

Further evidence was obtained by examining bits of lung tissue under the microscope. By a special technique, the platelets were stained intensely, so that they showed up clearly under the microscope.

"I have been able to show," Dr. Howell reported, "that they are produced, as a sort of solid secretion, by the giant cells, megacaryocytes, of the lungs."

"Megacaryocytes," he explained, "have been found in the lungs by many investigators, but they are usually sup-

posed to be sort of accidental constituents, cells that have escaped from the bone marrow and have been caught in the capillaries (tiny blood vessels) of the lungs, there to undergo degeneration.

"But my observations show, on the contrary, that they are actively growing cells whose cytoplasm is composed of platelet material and which branches out into the blood capillaries sometimes for quite a distance. Then processes break off and are carried off in the blood stream and break up by fragmentation into the tiny platelets."

Science News Letter, December 7, 1935

PHYSICS

Hot Stars Provide New Evidence For Einstein

VERY hot stars, with surface temperatures around 40,000 degrees, have provided the latest evidence in favor of the Einstein relativity theory.

Dr. Robert J. Trumpler, of the Lick Observatory, has found that the lines appearing in the spectra of those stars after their light has been analyzed through the prisms of a spectroscope, are shifted towards the red. This shift is greater than that shown by other stars closely associated with the hot ones. Dr. Trumpler expresses the view (*Publications of the Astronomical Society of the Pacific*, October) that this shift is similar to one found previously in the sun and other stars, and which was predicted by Einstein. It is believed to be due to the fact that the light waves are lengthened slightly when they leave such a massive body.

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The sturdy oak tree has more than 300 different insect enemies.

Until recently, Ethiopia's emperors always went to the holy city of Aksum for coronation.

MEDICINE

Find Highway For Germs Along Tongue Into Throat

DISEASE germs that enter the mouth with food, drink or air are not all swallowed, Drs. Lloyd Arnold and Carroll W. Stuart of the University of Illinois College of Medicine have discovered.

Some of the germs stick in the mouth, and they have a definite preferred highway where they travel. Brushing and gargling with antiseptic washes won't budge them from this travel zone. They persist there, seeding themselves over and over again until they all finally die of anemia, which requires from two to four hours, depending on the species.

Self-Disinfecting

The mouth has a good mechanism for defense against disease, Drs. Arnold and Stuart find. The cheeks and the edges and middle of the tongue can disinfect themselves. When foreign germs come in contact with these areas, they disappear within a few moments. But the surface of the gums near their juncture with the teeth, the palate, and the space between the edges and the middle of the tongue have no self-disinfecting ability. It is on these latter parts that the germs are retained and which they use as a highway for their travel into the throat.

They always travel down this highway, never up and forward of their own accord. If they come up from the throat, it is an involuntary projection, as in the sputum of a cough.

It was established several years ago in Dr. Arnold's laboratory that the line of the lips where the outer skin meets the lining skin is also a non-sterile area. The present investigation shows that foreign germs on this area likewise keep seeding themselves for several hours.

Live on Lips

Consequently, if your lips touch the rim of an infected glass or other object, the germs stay on your lips for several hours and your tongue, coming in contact with the lips, provides another seeding place for the germs to pass down your throat. If the resistance of your body is depleted, then these germs may cause sickness.

When a tuberculosis patient coughs up germs, these germs likewise stay on the tongue and lips for several hours, and any one or anything coming in contact with the lips of such a patient in that time is liable to be contaminated.

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PHYSIOLOGY

Ultraviolet Rays, Heat and Calcium Salts Cause Cataract

Protein of Eye Lens is First Denatured by the Ultraviolet, Then Coagulated by the Other Factors

ULTRAVIOLET rays, heat, and calcium (lime) salts are three inter-related factors in the production of cataract, Dr. Janet Howell Clark, of the Johns Hopkins School of Hygiene and Public Health, has reported to the Society of Hygiene of the Johns Hopkins University and the American Physiological Society.

How the cataracts of old people and of workers in certain industries develop may now be explained on the basis of Dr. Clark's research.

Cataract is an opacity of the eye lens or its capsule. Because one cannot see through an opaque lens, blindness results.

The protein of the eye lens and other protein solutions are denatured or changed by the action of ultraviolet light, Dr. Clark found. When this light-denatured lens protein is heated, or if a small amount of calcium or lime salts is present, the protein coagulates and becomes opaque.

The initial process of light denaturation may occur in the lens protein without any visible opacity, because normally only potassium salts are present and calcium salts are not, Dr. Clark reported. Presumably, although she did not make the point, this is the reason why not everyone develops cataract as a result of the everyday exposure of the eyes to some ultraviolet light from sunshine.

"There is probably always some denatured protein present in the lens as the result of exposure to sunlight," Dr. Clark stated, "and the amount may increase with age owing to the lowered metabolism of the lens. This denatured protein does not precipitate in the presence of potassium, but a calcium concentration as low as five-hundredths of one per cent. in the lens is sufficient to precipitate it at body temperature."

An accumulation of denatured protein in the lens in old age, combined with a higher amount of calcium in the blood, may therefore be responsible for senile cataract, Dr. Clark suggested.

The coagulation of light-denatured proteins is greatly hastened by heat. It

is probable, therefore, that the larger number of cases of cataract in workers with molten glass and metals is due to an increased rate of precipitation of light-denatured protein when the lens is heated above body temperatures by exposure to large sources of heat such as these workers experience.

To prevent the denaturation of the lens, which seems to be the first step in cataract formation or production, Dr. Clark warns that the eyes should be protected from radiation or light containing even moderate amounts of ultraviolet rays.

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ARCHAEOLOGY

Oldest Bible Fragment May be By St. John

HAVE scholars at last recovered some of the original Bible record about Christ written by Saint John himself, author of the New Testament Gospel of St. John?

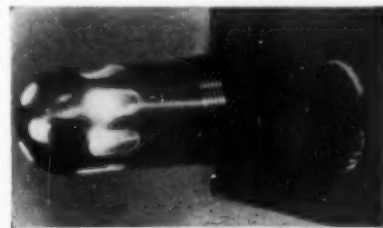
Possibility that the extremely old Bible manuscript which has come to light in Rylands Library, Manchester, may have this astonishing significance is seen by a London archaeologist who is keenly interested in the discovery.

That the small fragment of papyrus is the oldest New Testament manuscript ever discovered is agreed by British experts.

Suggesting additional importance for the ancient fragment, Sir Frederick Kenyon, former director of the British Museum, and authority on Biblical research, stated in an exclusive interview.

"I have little doubt that the fragment dates from the second century, possibly the early half. Allowing about a generation of time for making this copy in Egypt, one would suspect the Gospel written about the year 90 to 95 A.D. This does not exclude the possibility that St. John the apostle himself was the writer.

"Naturally, the only way to date the fragments is by an examination of the writing, but several experts on ancient



FOR SAFETY

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manuscripts are satisfied that it is correctly described."

How the ancient fragment reached Manchester is not yet known, but it may have come from Oxyrhynchus, in upper Egypt, where sayings of Jesus were discovered in 1897. The section of the Book of John now discovered deals with Christ's appearance before Pilate. It consists of verses in Greek from the eighteenth chapter—parts of verses 31 and 33 on one side and verses 37 and 38 on the other. It was written in book form, not in a rolled manuscript.

The fragment's estimated age sets it 200 years earlier than the famous Codex Sinaiticus, which is a fourth century Greek Bible consisting of the entire New Testament and less than half of the Old Testament. It is also earlier than the Bible pages known as the Chester Beatty papyri, which have recently been coming to light in Egypt and acquired eagerly by British and American scholars. Leaves of this Bible manuscript are not generally believed to be earlier than 200 A.D.

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ZOOLOGY

Wisconsin Trades Beavers For Illinois' Turkeys

TURKEYS were swapped for beavers, in an inter-state trading match between Wisconsin and Illinois, engineered by the U. S. Forest Service office at Milwaukee, Wis. Wild turkeys were extinct in Wisconsin, and Illinois had not had any beavers for many years.

But each state had what the other lacked. So a Forest Service truck carried twenty beavers across the line into northern Illinois, where they were "planted" on the small streams. On the return trip, the truck brought back fifty Illinois wild turkeys and turned them loose in the Wisconsin woods.

Both states regard it as a "fair trade."

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CHEMISTRY

Chemical Cousin of Perfume Replaces Water in Boilers

ACHEMICAL cousin of synthetic perfume is now being used in steam boilers instead of water to increase the power output for each ton of coal burned.

C. G. Brown, G. A. Gaffert, P. H. Konz and D. S. Ullock, all of Michigan University, have just completed tests on the new boiler chemical. Known as Dowtherm A, it freezes near room temperature, 54.7 degrees Fahrenheit, and is a mixture of di-phenyl and di-phenyl oxide.

At the high temperatures in steam boilers it yields a steam-like vapor but develops much less pressure than steam—a decided advantage.

The substance is related chemically to synthetic geranium perfume and to certain of the synthetic resins used in making plastic products.

Science News Letter, December 7, 1935

MEDICINE

Brighter Outlook For Heart Disease Patients

ABRIGHTER outlook for patients suffering from heart disease of the type known as coronary thrombosis appears in the report of Dr. Louis Faugeres Bishop, Jr., New York City, at the meeting of the Southern Medical Association.

It is no longer necessary for the patient to live in deadly fear when his ailment has been diagnosed as coronary thrombosis or occlusion, Dr. Bishop indicated.

"Now it is well known that the chances of an individual surviving the first attack are extremely good, 80 to 85 per cent.," Dr. Bishop said. "Life expectancy following coronary thrombosis may extend as long as seventeen years."

The particular type of heart disease Dr. Bishop discussed is that in which one or more blood vessels of the heart itself are closed so that the blood cannot get through to nourish the heart muscle.

Improved methods of diagnosis and treatment are the factor credited by Dr. Bishop for the improvement in outlook for these patients. The electrocardiograph and determination of the sedimentation rate help doctors to detect the atypical and milder cases and start treatment early. Physicians have also learned to be on the lookout for heart ailments when a patient complains of abdominal distress, since it is now known that the

symptoms of this form of heart disease and of abdominal disease may be very similar.

Prolonged absolute rest, oxygen, and a diet low in calories are now recognized as important parts of the treatment and are helping to prolong the lives of many heart disease patients, he pointed out.

Science News Letter, December 7, 1935

EUGENICS

British Scientist Attacks Racial Superiority Theory

TWO widely held biological opinions which are claimed to be the basis of the present policy of one European nation are attacked by Prof. J. B. S. Haldane of the University of London.

Sterilization of the unfit is not necessary for national hygiene, and the evidence that some races are superior to others is rather weak, Prof. Haldane pointed out in his Halley Stewart lecture.

As far as improving national hygiene by decreasing the number of unfit, other measures than sterilization are available in all cases, Prof. Haldane observed, mentioning as alternatives chastity or birth control for mentally normal persons and segregation for defectives.

"It is doubtful whether sterilization of all mental defectives would reduce the number in the next generation by 15 per cent.," Dr. Haldane said, referring to one of the arguments of those who favor sterilization of the unfit.

Prof. Haldane has analyzed five classes of human abnormalities that are determined genetically, or in the popular phrase, are inherited. His analysis shows that sterilization would be very effective in the case of such abnormalities as lobster claw, Huntington's chorea and similar conditions which may all be determined by dominant genes. Sterilization would be moderately or slightly effective in other conditions associated with dominant or sex-linked genes or the cooperation of several genes. It would, however, be totally ineffective in conditions associated with inbreeding, as in the marriage of cousins.

Discussing the theory of racial superiority, Prof. Haldane called attention to the fact that innate psychological characteristics of races overlap. Among the so-called races of Europe outside the Arctic there is also overlapping of physical characteristics.

Some facts, he said, support the theory that racial crossings for humans as well as other animals are advantageous in the first generation but harmful in later ones.

Science News Letter, December 7, 1935

IN SCIENCE

ZOOLOGY

Conservation Laws Make Moose Numerous in Sweden

THANKS to rigid game laws, Sweden now has the largest stock of wild moose in Europe, according to Wilhelm Kugelberg, a game preserve official. One hundred years ago the animal was found only in certain parts of the central provinces, Vermland and Dalecarlia, whereas today there are large herds of moose in practically every part of the country.

There is very little poaching, for the people as a whole take great interest and pride in the preservation of the animals. During the annual open season, which lasts only a few days, more than 6,000 animals are killed; but the game laws and the virtual absence of illegal shooting has helped to increase the stock enormously.

Science News Letter, December 7, 1935

BIOLOGY

Plant Spores Survive Trip to Stratosphere

SURVIVING conditions where man would die, tiny spores of important plant diseases are growing in a laboratory of the Department of Agriculture after journeying nearly thirteen and three-quarter miles into the stratosphere with the balloon Explorer II.

Discovery that spores can still live after being sent to an altitude of 72,395 feet is the first scientific result of the recent ascension sponsored by the National Geographic Society and the U. S. Army Air Corps.

Here is what the spores carried aloft by Capt. Albert Stevens and Orvil Anderson to a new world's record had to withstand:

1. Temperatures lower than 65 degrees below zero Fahrenheit.
2. Atmospheric pressure so low that man could not live in it.
3. Ultraviolet rays from the sun which never reach the surface of the earth and which are capable of killing some forms of life.
4. Ozone.
5. Extreme dryness.

Science News Letter, December 7, 1935

IN THE FIELDS

SEISMOLOGY

Quake Under Pacific 400 Miles off Ecuador

THE center of disturbance of the equatorial Pacific earthquake of Saturday, Nov. 23, has been calculated at a point about 400 miles off the coast of Ecuador, according to the U. S. Coast and Geodetic Survey. The epicenter was one degree north latitude and 86 degrees west longitude.

The position of shock, which was of moderate intensity, was computed from data supplied by Science Service through the cooperation of the following seismological stations: Georgetown University; St. Louis University; Coast and Geodetic stations at Honolulu and San Juan; the University of Wisconsin; the weather bureau station at Manila, P. I.; and the Carnegie Institution station at Huancayo, Peru.

Science News Letter, December 7, 1935

PHYSICS

Applied Physics Council New Link With Industry

A MOBILIZATION of physicists to aid industry is under way. Following the conference on industrial physics held at the University of Pittsburgh, a National Advisory Council on Applied Physics has been formed.

Radio, aviation, refrigeration and other new industries resulted from the application of physics. The research workers in physics are eager to bring home to business and banking leaders the possibilities of translating the products of the laboratory and physical theory into new products and machines for our civilization.

Forty leaders in physics form the new council, and they will point out the way physics can aid railroads, housing, air-conditioning, food preservation, glass, rubber, paint and other manufacture, photography, television and many other fields.

Included among the membership of the newly formed council are:

Dr. Karl T. Compton, president of Massachusetts Institute of Technology and chairman of President Roosevelt's

Science Advisory Board; Carl L. Bausch, Bausch and Lomb Optical Company; Dr. Lyman J. Briggs, director, U. S. Bureau of Standards; Dr. Paul D. Foote, executive vice-president, Gulf Research and Development Corporation; Dr. Lloyd A. Jones, physics department, Research Laboratory, Eastman Kodak Company; Dr. C. F. Kettering, general director of Research and Vice-President, General Motors Corporation; Dr. George B. Pegram, professor of physics, Columbia University; Dr. F. K. Richtmyer, dean of the graduate school, Cornell University; and Dr. Henry A. Barton, director of the American Institute of Physics.

Science News Letter, December 7, 1935

MEDICINE

Drop in Rickets Ascribed To Use of Vitamin D Milk

DISCOVERY in recent years of methods of adding the sunshine vitamin D to milk and other foods seems to justify the hope that the public health problem of preventing rickets can be solved. Dr. Fred O. Tonney of the Chicago Board of Health told experts at a conference on irradiation held by the Wisconsin Alumni Research Foundation, which holds patent rights to one method of adding vitamin D to foods and medicines.

The individual child may be safeguarded from rickets by the guidance of his own doctor, but for the great mass of children in the country, many of whom do not obtain medical care unless seriously ill, preventing rickets seems to be the problem and responsibility of the health officer.

One measure of protecting large numbers of children against rickets may be the addition of vitamin D to milk. The value of vitamin D milk from the public health standpoint cannot be estimated definitely yet, because of the short time since its introduction and the small amount consumed, Dr. Tonney pointed out. However, in Chicago during the past year the consumption of fluid and evaporated vitamin D milk has amounted to 16 per cent. of the total milk sales. During the same time severe rickets has disappeared and milder forms have declined noticeably in a group of preschool children examined regularly every year at child welfare stations, Dr. Tonney reported. He believes that vitamin D milk should therefore be given a more general trial as a rickets-preventing agent.

Science News Letter, December 7, 1935

NUTRITION

Little Girls Want More Spinach, Not Dessert

WHAT do girls ask for on "second helpings" when allowed freedom of choice from the menu? Desserts, one would expect; bread and jelly, at least.

Actually, according to a food study of the requirements of girls from 6 to 13 years of age, made by Martha Koehne and Elise Morrell at the University of Michigan, they ask for more meat, potatoes, and vegetables, or for more cereal and milk at breakfast, and especially for more fruit, seldom for custards and puddings constituting desserts. Second helpings of even spinach, liver and fish were requested. Nor does a quart of milk daily interfere with the amount of food the girls consume, according to the observers. On the contrary, children, they say, regard milk merely as something to drink, and eat as much food with it as without.

Another common belief, that children tire of the same menus repeated on certain days each week is exploded by this study. In fact, the children seemed to prefer repetition of well-balanced meals, to constant change.

This study forms part of an investigation into the factors which affect dental decay in children and consists of observations on 28 children between the ages of 6 to 13, hospitalized for local treatments which did not interfere with general body processes.

The relative amount of energy obtained from protein food in the standard diet, in which freedom of second helpings on any food was allowed and weighted carefully, shows a remarkable uniformity, and is very close to that recommended by authorities in the field of nutrition as optimum. Nutritionists recommend 15 per cent.; and the girls got 14.3 per cent. of the total calories of energy from the foods they ate.

Fat-rich foods were partaken of liberally; the percentage of calories from fat, 43.2, is a little higher than that recommended as optimum in earlier studies. For carbohydrate food, however, it is a little lower, 42.6 per cent. as against 51 per cent.

Calcium and phosphorus needs, too, were adequately met by the abundance of milk consumed, but iron tended to be rather low in the diet. Free choice of foods from this menu yielded a diet well on the basic side with respect to minerals, showing 5 parts base to 2 of acid.

The study ranged from 28 to 192 consecutive days.

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MATHEMATICS

Columbia Professor Solves 2,000 Year Old Math Problem

THE GREEKS of two thousand years ago started this mathematical discussion, but Prof. Edward Kasner of Columbia University finished it when he offered the solution to the National Academy of Sciences.

It concerns what the Greeks called "horn angles," the kind of angle that two curves make when they touch a point.

The conventional measure—and the Greeks had this measure—is zero degrees. Because angles of this kind are used in making maps of the Mercator projection sort, familiar in all school geographies, because they are useful in giving a real plotting to those illusive imaginary quantities of mathematics like the square root of minus one, and because they are useful in solving problems in heat and aerodynamical engineering, differentiating between these angles is of practical importance.

Here is how Dr. Kasner makes what might be called a "mathescopic" measure of the "horn angles," undifferentiated since the days when mathematics

was big news in the intellectual centers of old Athens. This new procedure will be written in modern mathematical books:

"Measure the curvatures of the two curved lines and measure the rates of variation of the curvatures. Then divide the difference in the rates of curvature by the square of the difference of the two curvatures."

This sounds and is technical, but it is the solution of a two-thousand-year-old problem which will have practical application in geography and engineering.

The beauty of this measure is that it remains unchanged through transformations that distort distances but preserve the angles, such as occurs when the surface of the earth's sphere is deformed to make a flat-surface Mercator projection for our familiar maps.

The myriads of possible horn angles, all labeled zero degrees heretofore, can each have another label varying from minus infinity through zero to plus infinity, and each takes its own place in mathematics.

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PHYSIOLOGY

Bones Continue to Change After Adulthood is Reached

THAT bone formation is an ever-changing process in the body and not a happening occurring only during youth is suggested by experiments just reported by two Danish scientists (*Nature*, Nov. 9).

Using phosphorus made artificially radioactive so that its atoms could be "traced," Prof. George Von Hevesy of the Institute of Theoretical Physics and Dr. O. Chiewitz of the Finsen Hospital, Copenhagen, have studied the absorption of phosphorus atoms in bone formation.

Using experimental rats, the scientists found that the phosphorus atoms fed in the food take about two months before they come out of the body. They report:

"The experiments suggest strongly that the formation of bones is a dynamic

process continually taking up phosphorus atoms which wholly or partly replace others."

It was found that 30 per cent. of the phosphorus atoms deposited in the skeleton of an adult rat were removed in the course of twenty days, and that the front teeth absorbed ten times as much phosphorus as the average for the whole skeleton. The molar teeth, by contrast, absorbed less than the average.

The technique employed in the experiments was to add radioactive phosphorus to one milligram of ordinary inactive phosphorus to such an extent that the Geiger counter, used in detecting the radioactive element, registered 1,000 clicks a minute.

Thus, if any product obtained later by subsequent biological or chemical reactions gave only one click a minute, the

scientists knew only one thousandth of a milligram of the inactive phosphorus was present.

The ability of radioactive phosphorus atoms to act as tracers through the animal body is comparable with research on heavy water whose "heavy" isotopic atoms can similarly be used for tracing biological happenings.

Last January Prof. Hevesy reported that after a person drinks a glass of water nearly one half of it is still in the body after nine days. He used the heavy hydrogen atoms in heavy water to detect the process of elimination. His present report on phosphorus absorption is similar research with a different chemical element.

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PHYSIOLOGY

Unique Case of Inverted Stomach Is Described

CAUSES of upside-down stomach, the rare condition which came to be generally known when little Alyce Jane McHenry travelled half way across the country to have an operation for it, were described by Dr. D. A. Rhinehart of Little Rock, Ark., at the meeting of the Southern Medical Association.

The condition is most often due to a defect in the left side of the diaphragm, Dr. Rhinehart said. The diaphragm may be missing or ruptured at birth or may become ruptured some time after birth, with the result that the stomach gets up into the chest cavity and turns upside down. Paralysis of the side of the diaphragm is another condition that may be found with upside-down stomach.

A unique case of inverted or upside-down stomach in a patient who had a normal, intact diaphragm was described by Dr. Rhinehart. This patient was a widow 65 years of age who came to the doctor for relief of severe cutting pains in the right upper quadrant of the abdomen. For 20 years she had had mild generalized discomfort and uneasy sensations in her abdomen. When Dr. Rhinehart examined her he found she had gallstones and an inverted stomach. But her diaphragm, though thicker than normal, was intact and at the normal level. Dr. Rhinehart explained that her stomach must have turned upside down during its development, before she was born, another part of the digestive tract rearranging itself to permit this unusual position of the stomach.

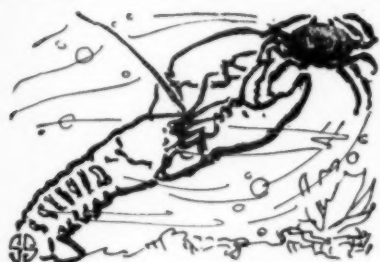
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Ambulances are now being equipped with air-conditioning units.

BIOLOGY

NATURE RAMBLINGS

by Frank Thone



Repairs and Replacements

LOSING a leg makes little difference to many of the lower forms of animals.

There seems to be a sort of inverse relationship between the evolutionary rating of an animal and its ability to replace broken or lost parts. If a man loses a leg, he is a cripple for life. If a salamander or a spider or a crab loses a leg, it will grow a new one with little more trouble than it costs a human being to re-grow a scraped-off patch of skin.

In some of the still more primitive orders of animal life, this process of regeneration, as it is called, is carried to an even greater extreme. If you cut a starfish into five pieces, each severed arm stands a fair chance of survival, and will even develop new arms to replace the lost ones; though it is true that as a rule these regenerated arms do not reach full size. If you cut an earthworm in two, and give the halves a moist place to live in, presently you will have two earthworms. And there are some of the lower worms, even more elementary in structure than the earthworm, that can be cut into almost any number of pieces, each of which will shape itself up almost immediately into a miniature of the original organism, and in time grow to full size and normal function.

This regenerative ability may conceivably be interpreted as a means of survival in a tough, hostile and hungry world. The heavens and the earth, and the waters that are under the earth, all swarm with eager hunters and anxious prey. If a big lobster, for example, grabs a small crab by a leg or claw, or an alert bird makes a dive at a lizard and catches it by the tail, it is obviously better to survive the encounter minus a leg or a tail than to be eaten whole. And if you can grow a replacement for the lost

member, you're not much out in the final reckoning.

A very few of the warm-blooded animals can escape capture by similar mechanisms, though the regenerative power afterwards is quite limited. There is one genus of mice, in the Southwest, with a terminal tuft of hair at the end of the

tail. Catch one of them by this convenient handle, and he will give a sudden twist and run off, leaving a piece of the appendage in your hand. The severed stump bleeds a little, but soon heals over, and then proceeds to grow a new tuft of hairs at the end. But the shortened tail never grows any longer.

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PHYSICS

Russia Buys Low Temperature Apparatus From Cambridge

SOVIET Russia is to buy from Cambridge University the low temperature apparatus, including one of the world's most powerful electro-magnets, which Prof. Peter Kapitza has used in his experiments in atomic physics near absolute zero.

Prof. Kapitza, antithesis of the "man without a country," is the brilliant scientist who for some years did his research at Cambridge University in the Cavendish Laboratory of Lord Rutherford. Last spring Prof. Kapitza went home for a visit to Russia and was "detained" permanently because Soviet authorities decided that his work was so valuable it might well be done in the U.S.S.R.

In an interview Lord Rutherford revealed that the decision to accept the Soviet offer to purchase Prof. Kapitza's apparatus had been reached by a joint committee of Cambridge University and the department of scientific research of the Royal Society. Said Lord Rutherford:

"I am thoroughly in favor of the scheme as adopted. I think, on the whole, it is the happiest solution which could have been found for this difficult problem. The amount of payment, you will understand, must be treated as private. A new large electromagnet will be installed at the Mond Laboratory at Cambridge which will produce temperatures within a few thousandths of a degree of absolute zero."

Lord Rutherford and Prof. J. D. Cockcroft, assistant director of the Cavendish Laboratory, were reluctant at first, it was disclosed, to continue researches on the problems like those studied by Prof. Kapitza unless the latter, as a pioneer in the field, so desired.

The payment from U.S.S.R. will be amply sufficient to pay for the cost of building a new and more powerful electromagnet in England. Opinion regarding the strange purchase is that science will be aided in the end, for while a

slight delay will occur in the low-temperature atomic research, eventually there will be two sets of equipment where there was but one before.

One line of research which will also be undertaken with the new Cavendish magnet will be atomic bombardment with apparatus of the cyclotron type as used at the University of California.

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ART

Indian Art to Enliven Boulder Dam Power House

See Front Cover

OLD and new America will combine at Boulder Dam, when artists get to work with Indian designs.

In the control room, where workmen regulate tremendous forces of electricity and huge bodies of water, the expanses of gray wall are to be enlivened with Indian symbols of cloud and rain.

One of the designs, reproduced on the cover of this week's SCIENCE NEWS LETTER, is taken from a prehistoric Indian bowl found on the site to be submerged by the new lake. It contains symbols for lightning, (the step-like figures) clouds, water, and mesas.

Consulting artist Allen Tupper True, of the Bureau of Reclamation, has been studying Indian pottery designs, basketry patterns and sand paintings to adapt Indian symbols that represented natural forces. Indian motifs, he declares, offer possibilities superior to those of classic Greek and Egyptian.

Ten colors which predominate in Navajo rugs and Pueblo ceremonial sashes have been chosen. These colors, flung against vast areas of gray concrete walls, will be a deep, warm blue, black, brown, a concrete gray, warm white, jade green bordering on turquoise, brilliant deep red, vermilion, orange and yellow.

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AGRICULTURAL ENGINEERING

No More Straight Furrows

The Farmer Has Broken Age-Old Tradition, Plowing In Curves as New Weapon Against Soil Erosion

By DR. FRANK THONE

CROPS are in; it is winter now. Cornshocks dot the fields; down in Dixie the last of the white-loaded wagons have creaked to the cotton-gins. Through the stubble-fields the farmer has driven new furrows, preparing the land for yet another crop.

But look at the fields for a moment. Those are strange furrows he has plowed. For they break with a tradition so old that it seems to have come down from old Farmer-Grandfather Adam himself. They are no longer straight furrows.

Straight furrows used to be every self-respecting farmer's greatest pride of craftsmanship. The more nearly he could lay his field out as though with a yardstick the better he was spoken of by his neighbors—and thought of by himself. A crooked furrow was a weakness—even a sin. The line of the plow must run as undeviating, as dogmatic, as relentlessly orthodox, as the Puritan doctrine the farmer heard from the pulpit on Sunday.

Was the land level and even? Well and good: that made a straight furrow the more easy. Were there hills and hollows? Over them, through them, in a straight line! Aught else was slipshod work, likely an offense to Jehovah, certainly a mocking to the neighbors. The furrows must be straight, straight, straight!

But what was Grandson doing, driving these curving, winding furrows around the side of the hill, instead of going boldly over it? Has he grown soft, degenerate? Is he no longer worthy to be the master of the acres? No longer a real farmer?

Tradition Poor Guide

Not at all. He has only learned in this, as he has learned in other things of late years, that tradition is not necessarily a sure and safe guide, that the old ways are not certainly the best ways.

That they may even be the worst ways. That by following the fashions of his fathers he may actually be robbing his sons. Robbing them of the land his fathers strove, almost starved, to get,

that he has sweated through lean years to hold. Land that he has suddenly seen slipping away literally from beneath his feet, taken by a foreclosure more remorseless and beyond redemption than anything that could be imagined from the harshest laws, the most grasping money-lenders.

Erosion Conscious

For within the past half-decade the farmer has suddenly become erosion-conscious. He knows now the insidious enemy that perverts his ancient friend, the rain, and uses it to work his ruin. And he is coming to see that straight furrows, his traditional habit, almost his religion, have played straight into the hands of the enemy, hastening the eating away of his best soil, the wastage of the fertile top layer, the devourment of the slopes by gaping gullies.

He has seen it, and we all must see it, though the feet of some of us never leave bright-lighted pavements. If we do not see it, and in some way put all our hands to the plow to prevent it, we

shall presently find ourselves a nation without bread.

In the face of a great national peril in ancient Israel, there arose a great prophet, who even while he warned of doom also held out a promise of rescue, if the people would only hear and act: "Behold, *now* is the acceptable time!"

In modern America, faced with a national peril even more grave than the swords of the Assyrians, there stands in our midst not one prophet but a whole army of prophets. They also tell us that "Now is the acceptable time," and warn us that tomorrow it may not be. They are not mystics like Israel's prophets, but their vision is not less sure, for they are the men of science, and they know whereof they speak.

Saving Our Daily Bread

It is they who have taught many farmers to plow curving furrows and to do many another thing that their forefathers would have thought useless or even mad. It is they who will show us the way to national salvation of our land, to the final insurance of our daily bread.

To be sure, they do not look or talk like prophets. (But then, if you could have stood in the market place of Old



STRAIGHT FURROWS: DEATH

A torrential downpour of rain on land plowed in straight furrows may produce the desolation shown in this picture. An idea of the size of the paths of destruction is given by comparison with the size of the man standing near the center of the picture.



CURVING FURROWS: LIFE

Where ground is sloping, plowing in lines conforming with the contours of the land prevents erosion.

Jerusalem, probably Isaiah wouldn't have looked much like a prophet, either.) These prophets of the new dispensation in land do not even look like the conventional picture of scientists. They are young men, they wear old clothes, and they talk like farmers.

There is dirt on their shoes. They glory in the epithet "dirt scientists," and in appearance at least they are indistinguishable from the "dirt farmers" among whom they work—who are, indeed, often their own blood kin and neighbors.

To do justice to history, it must be remembered that this New Deal in land use antedates the New Deal in politics. It was a commission appointed by former President Hoover that first investigated the peril of soil erosion, and sounded the warning aloud over the land. Under President Roosevelt their activities were propagated broadcast, until now there are about forty different soil conservation projects on which they work, with at least twice or thrice as many more in process of development. The map of the United States is already dotted with them; a year hence it will be peppered with them.

Two Phases

Water erosion of soil, which these men live to fight, works its mischief in two principal phases. When the surface has been stripped and laid bare, whether through over-cultivation, over-grazing, or reckless removal of trees, the first phase of destruction is the gradual disappearance of the topsoil. The appearance of the surface may not change

much, but inch by inch through the decades and generations the rich soil that best nourishes the crops grows thinner and thinner. This phase is called sheet erosion. There are many, including many farmers, who do not know sheet erosion because it is hard to see, and who will even deny that it happens.

But no one can deny the reality of the next phase, gully erosion. The least-educated "city feller" can see that. That sets in when little runnels of rain start cutting through the surface and making tiny canyons across the field. The loose soil, no longer bound by roots of grass or trees, yields easily, and presently the miniature canyons are magnified a thousand-fold, and the hungry gully gnaws and gnaws at the side of the field, like the vulture at the side of Prometheus.

Fertility Decreased

Along with erosion goes loss of fertility. Crops become less per acre even while the acres themselves shrink. At last arises a generation of farmers who suffer for the sins their fathers unknowingly sinned against them: there is failure, foreclosure, another abandoned farm, another family drifted to the city "on relief," helpless feeders instead of providers of food.

The counter-attack of the "dirt scientists" follows many lines. If you stop at one of these nests of erosion-fighters and get acquainted with the personnel, you discover quickly that they are not all alike. One will be a soil specialist, another an engineer, a third a forester, his neighbor an entomologist. Each knows the weaknesses of the land he is defending, each can contribute some ele-

ment of strength. The counter-attack is as complex as the attack of a modern army, with its aircraft, its tanks, its artillery, its machine-guns, its infantry, and all the rest.

There is something quasi-military, as well as something of the prophetic, about the activities of these erosion-fighters. (Some of Israel's prophets were soldiers, too.) They study the problem imposed by the presence of the enemy, they consider the most effective and economical means to thwart his activities, they set their strategy into action.

Hills the Key

Like soldiers, much of their combat consists of digging in the dirt. Like soldiers, they undertake to hold the hills. But unlike soldiers, they do not get on top of the hills and try to prevent the enemy from coming up. They get on the sides and bottoms of the hills, and their endeavor is to prevent the enemy from coming down.

Water, and the torn earth it carries with it, chooses the straightest road down the hill. Here is where the reasonableness of straight-plowed furrows come in. They are often ready-made beginnings of gullies; all erosion has to do is widen them.

To thwart erosion, the defenses must lie across its path, just as military defenses must lie across the path of the enemy. Hence the curving furrows. They follow the "contour lines" of the slopes, so that they are always at right angles to a line drawn at any point from top to bottom.

Breaking the Force

And as the furrows run, so run the crops that follow them. Sweeping on the long curves around the hill, they everywhere oppose the stubborn insistent hold of roots in the soil to the straight down-charging little streams of water. They deflect them, break their force, turn them again into allies rather than enemies.

Further strength is gained by alternating the easily erodible "clean-cultivated" crops like corn and cotton with sod-forming strips of grass and clover, or long-rooted, close-set crops like sorghum. This is called "strip-cropping." This also introduces a new element into the farm landscape. No more endless fields of the same crop, but (where conditions call for it) alternating bands of two, three or more kinds of plants in the same field, like a piecework quilt. It looks queer, but it is better farming.

One farmer, after he had got the hang of contour-plowing and strip-cropping, said to the Government man who had suggested it to him: "Well, at least

"I'll not need to take a jug of drinkin'-water to the field with me; all my furrows will end near my pump." In his particular case this was nearly literally true, for his farm stood out on the end of a jutting hill, and he had to plow horseshoe-shaped strips back and forth.

A step advanced beyond strip-cropping is the building of terraces. These are imperative on steeper slopes, desirable on almost all slopes. Terraces, have, indeed, been used a good deal in parts of the South, but as yet have not taken much hold elsewhere. The erosion-fighters are experimenting with various soil types, in different parts of the country.

Not New

Terraces are nothing new in farming. Indeed, they are among the oldest of farming devices—so old that their origins have been forgotten. But you find them everywhere: all through the Orient, in the ancient lands of the Incas, on the steep slopes of the Rhine and Moselle where the famous vineyards are that the Romans first planted. The mysterious "lychets" of English hillsides may have been cultivated terraces in the New Stone Age, ten thousand years ago.

Terraces take time, and at least a little expense, to build. But once built, their flat tops are almost erosion-proof, and their steep sides are given to grass or other permanent vegetation, to hold them in place. At the ends, where the runoff waters must drain, wide runways are left, and long grass is encouraged to grow in these so that the water may

slide over without cutting the earth loose and starting another gully.

New Hope

With contour-plowing, strip-cropping and terraces, then, the fields may be redeemed. The gullies, hopeless-looking rents in the earth, next challenge.

Here the engineers and foresters enter the fight. In the deepest and most menacing pits, the engineers throw in dams: stone where they must, though that is laborious; earth fills, or stakes-plus-wire-plus-brush, where they can. These obstructions slow down the water, permit the silt to deposit and fill up the holes. Maybe the sides are scraped or dug in a bit. What once was a deep, angular gash presently becomes a shallow, curved swale filled with marsh-grasses and cattails—a very much friendlier place.

While the engineers block the main gully with dams, the foresters attack the flanks with roots. They plant trees along

the sides, trees with long, fast-growing roots that will hold the soil and prevent the gully from growing wider.

A favorite species is black locust. It has the right kind of spreading roots, it "suckers up," forming dense thickets, it eventually makes good post-timber (if the borers will only let it alone), its feathery foliage permits grass to grow underneath, it is a legume, enriching the soil. Plainly, a tree of many virtues.

Erosion's fight against man has gone on almost unnoticed since pioneer days. Man's fight against erosion has just begun. Whatever the future political vicissitudes this country may face, this is the one of the newer Government activities that simply must go on. If it is stopped, presently there will be no land for either conservatives or radicals to govern at all. The rest of our farmers must be converted to the Curving Furrow. In this sign they shall conquer.

Science News Letter, December 7, 1935

GEOLOGY

Artificial Lava Currents Show What Happens in Earth

A UNIQUE device for the study of the behavior of rocks and molten lavas in deeper parts of the earth's crust has been designed by Dr. Robert Balk, chairman of the department of geology and geography at Mount Holyoke College, and built especially for him with funds from the Carnegie Institution of Washington. Research along this line is expected to reveal interesting and hitherto unknown facts concerning the origin of certain deposits of ore minerals, especially chromium, nickel and iron oxide magnetite.

The machine consists of a series of tanks about six feet long through which flows a current of artificial magma or molten lava. Hundreds of solid particles are suspended in the magma to simulate the crystal grains that float in the real magma reservoirs forty miles below the earth's surface. Obstructions are then placed in the path of the current, so that the floating grains must converge, accumulate or diverge in the same way that the actual crystals do below the earth's crust.

The process is similar to the formation of streaks of smoke or dust behind a moving automobile or to the development of foam trailers behind a moving steamer, and is believed to have

a bearing on the origin of certain deposits of ore minerals.

In explaining the operation of his machine, Dr. Balk pointed out that the movements of molten masses, involving thousands of cubic miles of material erosion, have laid bare the surface of these enormous intrusive magmas. This is because millions of crystals that were kept afloat in the molten mixture register after erosion the directions of movement by lining up in the fashion of trailers parallel to the directions of elongation. The mechanism of this entire process is reproduced on a small scale by Dr. Balk's machine.

Another device recently built by Dr. Balk illustrates the manner in which fractures accompany folds and similar deformations of the earth's crust. Only two similar experimental devices, one at the University of Bonn in Germany and another at the Johns Hopkins University, have been constructed so far. The machine consists of a cake of wet clay stretched over a double sheet of tin. Through variations of the intensity of stretching and of the consistency and thickness of the clay mass, Dr. Balk will be able to imitate accurately a number of natural processes of rock-strata fracturing.

Science News Letter, December 7, 1935

The Freedom of Man

By ARTHUR H. COMPTON

Every scientist will be interested in this new book by the distinguished physicist, in which he discusses the relationships between his own scientific and religious thinking. Professor Compton argues that man is far from being a creature who fundamentally obeys inevitable laws; the universe is fundamentally unpredictable and man is fundamentally free. From this point of view he describes man's place in the universe as it is revealed to a scientist, and man's relations to the greater forces that lie beyond him. The book is based on the Terry Lectures delivered at Yale University. \$2.00.

YALE UNIVERSITY PRESS
New Haven, Conn.

•First Glances at New Books

Additional Reviews
On Page 368

Exploration

EXPLORING TODAY—Lincoln Ellsworth—Dodd, Mead & Co., 194 p., \$1.75. The poles; the tropics; far seas; mountains; deserts; jungles; the stratosphere; the bottom of the ocean—in a day when "there is nothing left to explore," explorers are more numerous and more busy than ever. One of the best known and most successful (because the most competent) of present-day explorers reviews possibilities, suggests practical means and methods, debunks "adventure." The book deserves to be as successful as Mr. Ellsworth's explorations have been.

Science News Letter, December 7, 1935

Physics

TRANSACTIONS OF THE AMERICAN GEOPHYSICAL UNION, 16TH ANNUAL MEETING, 1935—National Research Council, 2 vol., 530 p., \$3.50. No free copies available.

Science News Letter, December 7, 1935

Engineering

DIESEL AND OTHER INTERNAL-COMBUSTION ENGINES—Howard E. Degler—American Technical Society, 237 p., \$2.50. A practical text book on the development, principles of operation, construction, and performance of Diesel and gasoline engines.

Science News Letter, December 7, 1935

General Science

LABORATORY EXERCISES FOR MY OWN SCIENCE PROBLEMS—Hunter and Whitman—American Book Co., 168 p., 44c.

LABORATORY EXERCISES FOR SCIENCE IN OUR SOCIAL LIFE—Hunter and Whitman—American Book Co., 180 p., 48c.

LABORATORY EXERCISES FOR SCIENCE IN OUR WORLD OF PROGRESS—Hunter and Whitman—American Book Co., 232 p., 60c.

Science News Letter, December 7, 1935

Education

PARENTS LOOK AT MODERN EDUCATION—Winifred E. Bain—Appleton-Century, 343 p., \$2.50. Introducing elders of the old school to what their youngsters are encountering in the new.

Science News Letter, December 7, 1935

Zoology

THE INVERTEBRATA, 2d Ed.—L. A. Borradaile, F. A. Potts, L. E. S. Eastham and J. T. Saunders—Macmillan, 725 p.,

\$4. When a book that can be used only in more advanced university classes in zoology goes into its second edition within three years, as this one has done, it is argument that it has been recognized and is in demand. The new edition contains new matter in the chapter on insects, and in the general chapter introducing metazoa.

Science News Letter, December 7, 1935

Physics

COLLEGE PHYSICS—C. E. Mendenhall, A. S. Eve, and D. A. Keys—D. C. Heath, 592 p., \$3.76. A text for university and junior college students which, by a system of starring the more difficult sections, keeps mathematical treatment to a minimum. Basic definitions are in bold face type while the diagrams and illustrations are more numerous than are usually found in such a text.

Science News Letter, December 7, 1935

Geology

SOME FACTS ABOUT ORE DEPOSITS—G. Montague Butler—Univ. of Arizona, 99 p., 15c.

Science News Letter, December 7, 1935

Exploration

NANGA PARBAT ADVENTURE—Fritz Bechtold—tr. from German by H. E. G. Tyndale—Dutton, 93 p., 114 illus., \$3. What it is like to go with a Himalayan mountain climbing expedition is revealed with unusual vividness in this straightforward narrative of a hard, exciting, and tragic experience. The fine photographic illustrations, perhaps even more than the text, convey the spirit and the small realities of this type of great adventure. The expedition is that of 1934, and Nanga Parbat is the highest peak of the Western Himalayas.

Science News Letter, December 7, 1935

Psychology

COMPARATIVE PSYCHOLOGY—Vol. I: Principles and Methods—Carl J. Warden, Thomas N. Jenkins, and Lucien H. Warner—Ronald Press, 506 p., \$4.50. An authoritative work intended as a textbook for advance courses in comparative and genetic psychology, yet not too technical to hold interest for those in other related fields. This first volume provides background for the two which will follow on Plants and Invertebrates, and Vertebrates.

Science News Letter, December 7, 1935

Vocational Guidance

VOCATIONAL GUIDANCE IN ACTION—John A. Fitch—Pub. for Amer. Assoc. of Social Workers by Columbia University Press, 294 p., \$2.75. Should be useful as a text or reference book for those engaged in vocational guidance or placement.

Science News Letter, December 7, 1935

Biography

WALTER FRANKLIN PRINCE, A MEMORIAL—By Friends and Colleagues in Psychical Research—Bruce Humphries, Inc., 96 p., \$2. Personal and professional tributes to a man who was prominent in the field of psychical research.

Science News Letter, December 7, 1935

●RADIO

Tuesday, December 10, 4:30 p. m., E.S.T.
PURE WATER, by Dr. Henry B. Ward,
Permanent Secretary, American Association
for the Advancement of Science.

Tuesday, Dec. 17, 4:30 p. m., E.S.T.
RUNNING HORSES, by Dr. Harry H.
Laughlin, Department of Genetics, Car-
negie Institution of Washington.

In the Science Service series of radio discus-
sions led by Watson Davis, Director, over
the Columbia Broadcasting System.

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•First Glances at New Books

Additional Reviews
On Page 367

Sociology

THE GIRL IN THE RURAL FAMILY—Nora Miller—*Univ. of North Carolina Press*, 108 p., \$1.50. This book tells understandingly of the lots of such typical young American girls as those in the mountain farm family, the soft coal mine family, the cotton farm family, the tobacco farm family, the fishing community family, the potato farm family, and the superior rural family. Rural girls, as well as rural boys, have been kept in rural homes by the depression, or have been compelled to return to them. Suggestions are made for helping girls to meet problems raised by conflict between the old order and the new.

Science News Letter, December 7, 1935

Ethnology

MELANESIANS AND AUSTRALIANS AND THE PEOPLES OF AMERICA—Ales Hrdlicka—*Smithsonian Inst.*, 58 p., 25c. The theory that black-skinned people found their way to the New World and contributed to its racial and cultural prehistory is analyzed by Dr. Hrdlicka. His verdict is that the evidence is superficial, and the theory unsound.

Science News Letter, December 7, 1935

Education

EXPERIMENTAL STUDIES IN THE PSYCHOLOGY AND PEDAGOGY OF SPELLING—Alice E. Watson—*Teachers College, Columbia Univ.*, 144 p., \$1.50. If you know anyone troubled by such demons as "arithmatic," "bookkeeping," "eighthteenth," "fourty-fourth," "grammer," "rebellion," or "potatos," you will be interested in this scientific study of spelling difficulties.

Science News Letter, December 7, 1935

Social Science

APPLIED SOCIAL SCIENCE; JOURNAL OF THE NATIONAL INSTITUTE OF SOCIAL SCIENCES, Vol. XVI-XIX—*F. W. Faxon Co.*, 196 p., \$2. The Institute's Year Book has not been published since 1931. This volume contains the material accumulated in that time in somewhat abridged form.

Science News Letter, December 7, 1935

Psychology

SCENERY AND THE SENSE OF SIGHT—Vaughan Cornish—*Cambridge (Macmillan)*, 111 p., \$3. This is a rather unusual book: by an artist, it approaches an art problem from the distinct viewpoints of esthetics, optical physics, and psychology, striving to bring them all

together for a satisfactory solution. Critical points in the discussion are illustrated by skeleton sketches that bring them out even more vividly than completely finished pictures might be able to do.

Science News Letter, December 7, 1935

Zoology

SERPENTS OF THE NORTHEASTERN STATES—Raymond L. Ditmars—*New York Zoological Society*, 40 p., 38 illustrations, 50c. The Northeast is not the "snakiest" part of the United States, but it contains the most people, as well as a considerable variety of interesting snakes. Nobody better qualified to serve as introducer could be imagined than Dr. Ditmars; and in this booklet he does the job right well.

Science News Letter, December 7, 1935

Statistics

ELEMENTS OF STATISTICS WITH APPLICATIONS TO ECONOMIC DATA—Harold T. Davis and W. F. C. Nelson—*Principia Press*, 424 p., \$3.50. A text book giving the mathematical requirements of assembling, correlating and interpreting statistical data. Curve fitting, correlation, probability, index number, times series and methods of averaging are only a few of the chapter headings.

Science News Letter, December 7, 1935

Psychology

THE EVOLUTION OF MODERN PSYCHOLOGY—Richard Müller-Freienfels—*Yale Univ. Press*, 513 p., \$5. A comprehensive and interpretive survey of the historical background of this comparatively new science. Dr. W. Beran Wolfe, the translator, in a preface, calls attention to the often recurring question, "What is the difference between the teachings of Freud, Jung, and Adler?" "I know of no other book which has answered this moot question of modern psychology so succinctly and so understandingly," he added.

Science News Letter, December 7, 1935

Industrial Standardization

A. S. T. M. STANDARDS ON RUBBER PRODUCTS—*American Society for Testing Materials*, 204 p., \$1.25.

Science News Letter, December 7, 1935

Photography

THE AMERICAN ANNUAL OF PHOTOGRAPHY 1936—Ed. by Frank R. Fraprie—*American Photographic Publishing Co.*, 328 p., \$2.25 cloth, \$1.50 paper. Again a collection of excellent photographs of many subjects, plus a number of articles on photographic technique and apparatus. In addition to the technical treatises on various phases of photography itself, there is an article on cloud photography and one on clinical photography that have distinct scientific interest.

Science News Letter, December 7, 1935

Economics

MACHINERY, EMPLOYMENT AND PURCHASING POWER—*National Industrial Conference Board*, 103 p., \$2. The machine is defended in this study of economic and industrial conditions, before and during depression. Machinery does not cause unemployment and is not to blame for the depression.

Science News Letter, December 7, 1935

Education

FEDERAL COOPERATION IN AGRICULTURAL EXTENSION WORK, VOCATIONAL EDUCATION, AND VOCATIONAL REHABILITATION (U. S. Office of Education Bulletin, 1933, No. 15)—*Govt. Print. Off.*, 297 p., 25c. Now that educators are talking of Federal participation in, or encouragement of, public education, this survey of the past educational activities of the U. S. Government is timely.

Science News Letter, December 7, 1935

Anthropology

NASKAPI—Frank G. Speck—*Univ. of Oklahoma Press*, 248 p., 19 pl., \$3.50. What would it be like to see the world through the eyes of a Labrador Indian? Many things unseen by European eyes are real to the Naskapi, Dr. Speck shows. Naskapi culture, in fact, is so isolated that "its spirit is as strange to even the Iroquois mind as it is to the European." With the spirit of native religion of the Naskapi, manifested in strange ways, this thought-provoking book is concerned.

Science News Letter, December 7, 1935

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